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Extensor Carpi Ulnaris Subluxation

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Keywords

Hand surgery; wrist pain; patient outcomes; sports injuries

Background

Extensor carpi ulnaris (ECU) subluxation is an increasingly recognized cause of ulnar-sided wrist pain. The ECU tendon runs in the ulnar groove and is stabilized within a fibro-osseus tunnel. A subsheath acts as labrum on the ulnar border of the ulnar groove and prevents subluxation. Subsheath tears can occur with resisted forearm supination, wrist flexion, and ulnar deviation. Injuries are most common in athletes who play racquet or stick sports.[1] ECU subluxation also occurs in rheumatoid patients owing to synovitis and attenuation of the subsheath.[2] This article reviews pertinent anatomy, diagnosis, and management of ECU subluxation.

Anatomy

The ECU originates at the lateral epicondyle of the humerus and inserts on the base of the fifth metacarpal. At the wrist level, it runs within the sixth dorsal compartment and is stabilized by a distinct subsheath (Figure 1). The subsheath is deep to the extensor retinaculum and maintains the tendon within the ulnar groove – it acts as a labrum along the ulnar side of the groove and prevents tendon subluxation. The subsheath lacks elastic fibers and is resistant to rupture. It is reinforced by the *linea jugata*, a sling of collagen fibers that inserts onto the interosseus membrane.

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Pathophysiology

ECU tendinopathies are classified as constrained or unconstrained.[3] In constrained tendinopathy, the subsheath is too tight and restricts tendon gliding - this causes pain and dysfunction.[4] Unconstrained tendinopathy occurs if the subsheath is torn or attenuated - the tendon subluxates around the ulnar head.[3] Both tendinopathies produce ulnar-sided wrist pain. A careful history and physical examination can help differentiate between the two.

The ECU is under maximal stress when the wrist is supinated, flexed and ulnarly deviated. If the subsheath tears, the ECU subluxates volarly and ulnarly over the ulnar head. Sudden, forceful contraction of the ECU or repetitive, minor trauma causes attenuation of both the tendon and the subsheath.[2,5] It may be necessary to treat both the subsheath and the tendon during surgery.[4]

Tears to the subsheath are classified into three types (Figure 2). Type A is the most common and occurs at the ulnar side of the subsheath. The tendon is able to return to ulna groove under the torn edge of subsheath. Type B tears occur at the radial side of the sheath and are and less likely to heal as the tendon lies outside of the torn sheath. The third class, Type C, occurs when the fibrous subsheath is detached from the ulna's periosteum. With this widened subsheath, the tendon can move out of the ulnar groove and remain in a false sheath.[1] Understanding the classification of subsheath tears is important when evaluating a new patient, as some tears are unlikely to heal with conservative management.[5]

Physical Exam

ECU subluxation can be a challenging diagnosis. Patients may present to an athletic trainer or primary care provider before referral to a hand surgeon. It is important that providers who treat at risk athletes are aware of its presenting signs and symptoms. Patients with an acute injury present with swelling, tenderness and pain over the dorsal ulnar wrist. In the chronic setting, tendon snapping and wrist instability may be present.

The ECU synergy and subluxation tests are helpful diagnostic maneuvers.[6,7] To perform the ECU synergy test, the patient supinates the wrist and the examiner applies resistance at the radial side of the hand. The patient's elbow should be resting on the table, the wrist neutral, and the fingers extended (Figure 3). This position provokes isometric contraction of the ECU and flexor carpi ulnaris muscles. The test is positive for a constrained ECU tendinopathy if the patient has pain. The examiner may palpate bowstringing of the tendon if there is subluxation. The synergy test has been shown to predict ECU tendon abnormalities when compared to sonographic evaluation. Sato et al found the ECU synergy test had a sensitivity of 74% and specificity of 86%.[8]

To perform the ECU subluxation test, the patient supinates while the examiner applies resistance to the ulnar aspect of the hand. The patient is then asked to ulnarly deviate the wrist. This test should be performed by the examiner on both wrists for comparison of asymptomatic subluxation.[6] Another test to evaluate both wrists simultaneously is the "heart-like test." In this test, the backs of the hands are placed together against the chest

with the thumbs pointed up. This provoking maneuver can produce the snapping sound and sensation.[3]

Imaging

Wrist radiographs are mandatory to rule out bony pathology. Due to its superficial location, the ECU tendon can be assessed with ultrasonography. This must be used in conjunction with the patient's history as this dynamic imaging can also identify ECU subsheath instability in asymptomatic patients. MRI can be used to characterize the anatomy of the tendon and the ulnar groove, but it is not routine in pre-operative planning.[9]

Treatment

Initial management is immobilization in a long-arm cast for six weeks. Surgery is indicated for patients who continue to have pain or instability after a trial of splinting.

Surgical Options

In the acute setting, primary subsheath repair may be possible. This assessment is made intraoperatively based on the injury and involved tissue. The torn subsheath can be debrided and repaired in some acute type A and B tears. In the acute Type C tear, a similar primary repair would be reattaching the avulsed periosteum to close the sheath over the tendon.[3] For chronic injuries, reconstruction of the subsheath is often necessary. There are multiple techniques using flaps of extensor retinaculum with or without bone anchors. Our preferred technique is to use an ulnarly-based flap to create a sling for the ECU tendon. This reconstruction was first reported by Spinner and Kaplan.[2] The only contraindication is a history of prior wrist surgeries with scarring of the extensor retinaculum.[10]

Surgical Technique

The surgery is performed under general anesthesia or an axillary nerve block with a tourniquet. A five-centimeter incision over the dorsal ulnar wrist is made for exposure (Figure 4). The dorsal sensory branch of the ulnar nerve runs in the subcutaneous tissue in this area and must be avoided. The extensor retinaculum over the 6th compartment is incised to expose the ECU tendon. The torn edges of the subsheath and any frayed tendon are debrided. If the subsheath edges come together without tension, a primary repair can be performed at this stage. If proceeding with subsheath reconstruction, a 3-cm wide flap is planned (Figure 5). The flap is based at the ulnar border of the fifth extensor compartment. The radial limit is the radial aspect of the third compartment. The flap is carefully elevated from radial to ulnar.

The ECU tendon is then carefully mobilized from the damaged subsheath. The flap of extensor retinaculum is passed under the ECU tendon (Figure 6). The flap is wrapped around the tendon and sutured to itself with 2-0 Ethibond sutures (Figure 7). These sutures control the size of the new ECU tendon sheath. It is important to assess the relationship of the ECU tendon and the new subsheath. If this is too tight, the patient can develop ECU tendonitis postoperatively. If it is too lax, the wrist will continue to be symptomatic. Additional sutures can be placed to anchor the flap to the adjacent extensor retinaculum.[11]

If there is concern for other wrist pathologies, one can perform wrist arthroscopy during the same procedure. This is both diagnostic and potentially therapeutic, minimizing the risk of reoperation for unaddressed second pathology. Half (8 out of 15) of the flap repairs done in the published series from Massachusetts General Hospital required an additional surgery. The most common was tenosynovectomy (4 out of 8 combination cases), followed by triangular fibrocartilage complex repair (2 of 8 combination cases).[4] A similar observation was made in a series from Austria. Of twelve patients undergoing ECU extensor retinaculum flap reconstruction, six had isolated ECU pathology. Other surgeries performed at the time of the flap ranged from arthroscopy to ulnar shortening.[12]

Post-operatively, patients are placed in a long arm splint with the wrist in neutral for 4-6 weeks. Patients should avoid strenuous physical activities for three months.[11] Recurrence of symptomatic subluxation and ECU tendon rupture is rare.[10] Some patients may experience post-operative tendinitis[4] - this could be due to residual tendinopathy, but it underscores the need for careful sizing of the reconstructed ECU sheath.

Discussion

Subsheath reconstruction with the extensor retinaculum flap has high rates of patient satisfaction.[4,10,12] A single-center series published in 2020 found no recurrent subluxation.[4] If MRI is used to confirm the diagnosis, it can be used to compare post-operative results. A group in Austria published a series of 12 patients with pre- and post-operative MRI findings. The authors reported four patients with persistent ECU dislocation on repeat MRI. However, these patients all reported excellent satisfaction with the surgery.[12] Although this is a small study, it suggests the etiology for ulnar wrist pain may not be the action of tendon dislocation. This is supported by the radiologic findings of subluxation in asymptomatic wrists.[13] Additionally, a cadaveric study identified ECU subluxation with intact subsheath.[14] The resolution of pain after reconstruction of the sheath suggests the relationship between subluxation and pain is more complex.

Research continues to support and refine surgical approaches. The ulnar groove can be deepened with a bur if it is too shallow, but there is no evidence to support routine deepening. A cadaveric model evaluating routine deepening of the ulnar groove did not find increased stability of the repair.[15] Understanding the underlying biomechanics of the ECU tendon-subsheath complex is vital to improving surgical outcomes. Current studies highlight opportunities to further investigate the etiology of ulnar-sided wrist pain associated with tendon subluxation.

Summary

The unique function of the extensor carpi ulnaris subsheath serves to stabilize the wrist during movements. Damage to the subsheath can result from sports injuries or traumatic movement and produces ulnar-sided wrist pain. Conservative management allows for anatomic healing in only some causes of subluxation. Surgical repair facilitates return to sports and function.

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Key Points:

The subsheath is vulnerable to tears in acute wrist movements, especially those combining supination, flexion and ulnar deviation. Surgical repair with a flap of extensor retinaculum to recreate the tendon's stabilizing subsheath is recommended.

Clinics Care Points

- ECU subluxation can be a challenging diagnosis as a cause of wrist pain.
- Surgery is indicated for patients who do not respond to conservative measures.
- Perform a tension-free repair of the torn subsheath, if possible.
- A flap of extensor retinaculum can be used to recreate the ECU subsheath with good long-term outcome.

Synopsis

Extensor carpi ulnaris tendon subluxation can be a challenging diagnosis as a cause of wrist pain. The tendon is stabilized by a tough subsheath. This subsheath is vulnerable to tears in acute wrist movements, especially those combining supination, flexion and ulnar deviation. The patient presenting acutely may experience swelling, tenderness and pain. In a chronic setting, the complaint is often an unstable wrist. The diagnosis can be made with a thorough examination and ultrasonography can be used to evaluate the dynamics of the tendon. Surgical repair with a flap of extensor retinaculum to recreate the tendon's stabilizing subsheath is recommended.

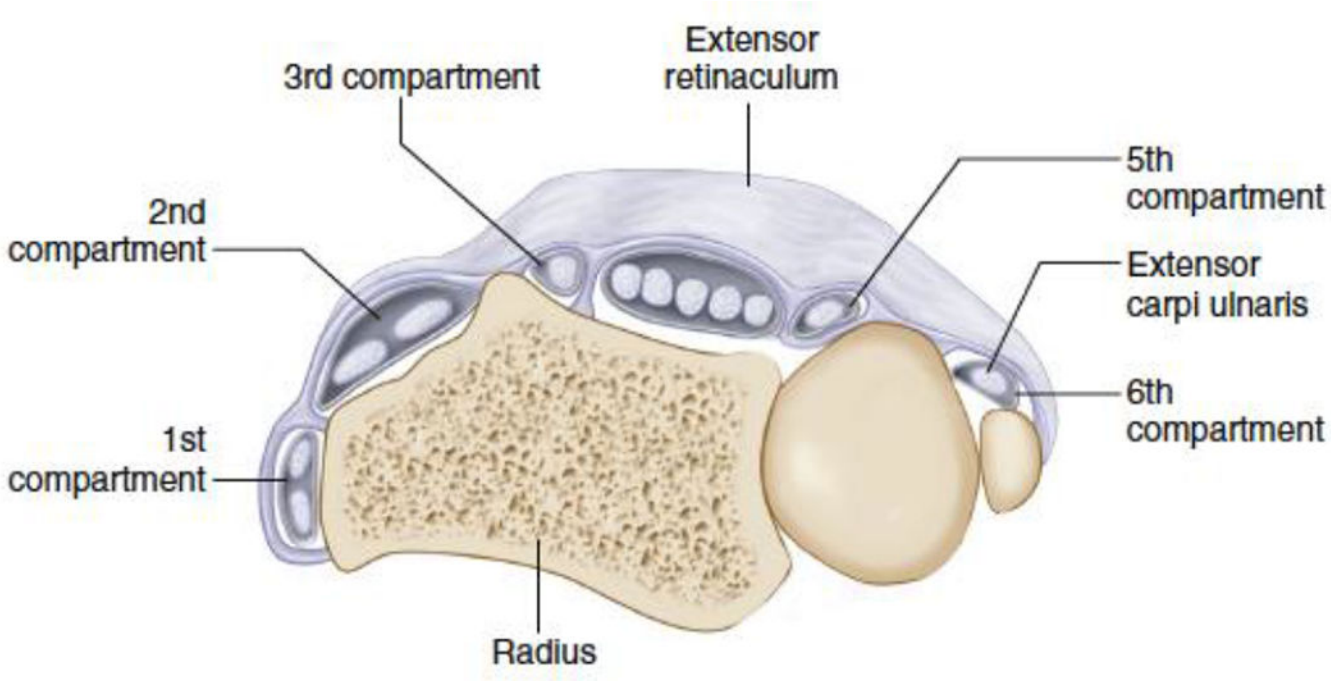

Figure 1.

6th dorsal compartment. From Sears ED, Fujihara N, Chung KC. Stabilization of Extensor Carpi Ulnaris TendonSubluxation with Extensor Retinaculum. In: Chung KC, ed. *Operative Techniques: Hand and Wrist Surgery*. Elsevier; 2018:636-641

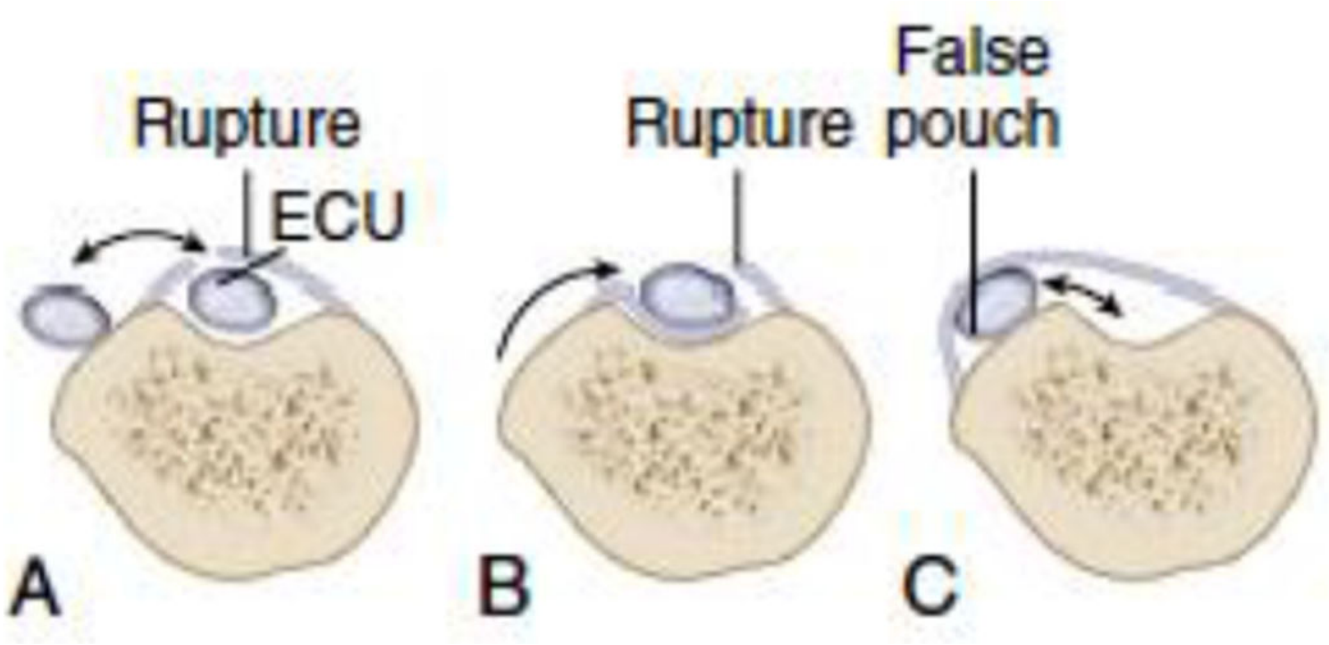

Figure 2.

Classification of subsheath tears. From Sears ED, Fujihara N, Chung KC. Stabilization of Extensor Carpi Ulnaris Tendon Subluxation with Extensor Retinaculum. In: Chung KC, ed. *Operative Techniques: Hand and Wrist Surgery*. Elsevier; 2018:636-641

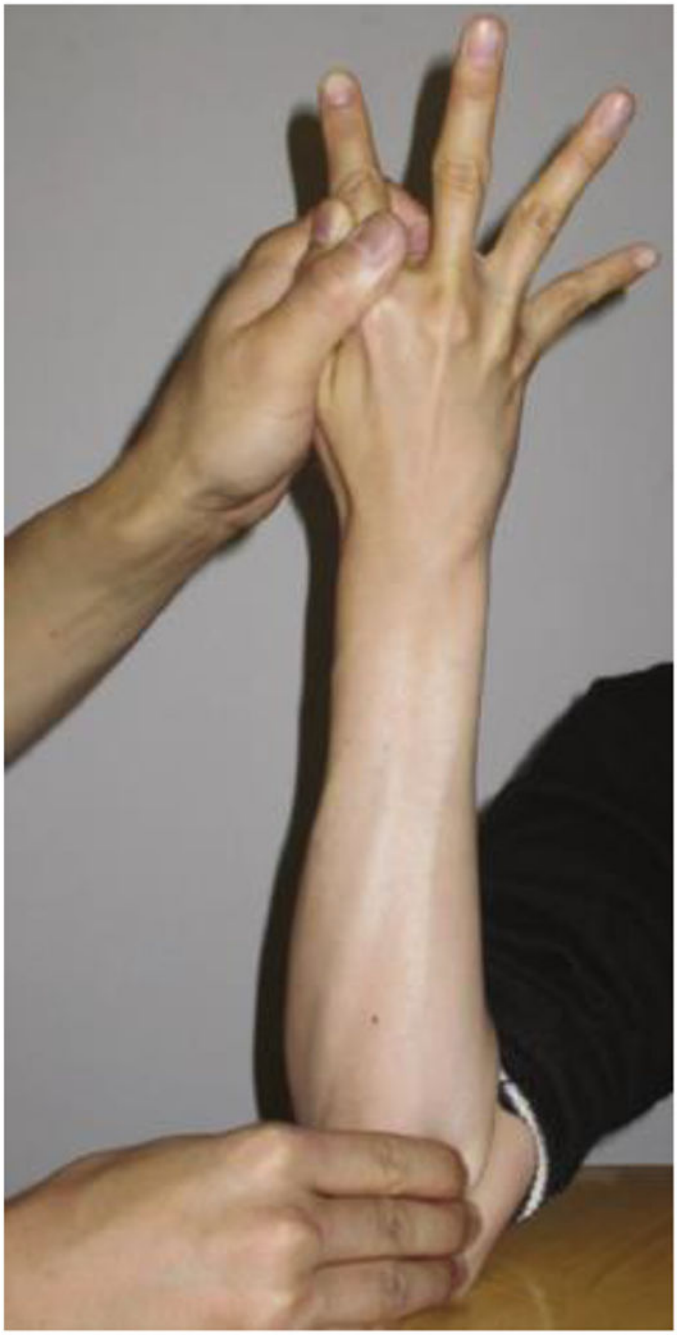

Figure 3.
The ECU synergy test. From Sears ED, Fujihara N, Chung KC. Stabilization of Extensor Carpi Ulnaris Tendon Subluxation with Extensor Retinaculum. In: Chung KC, ed. *Operative Techniques: Hand and Wrist Surgery*. Elsevier; 2018:636-641

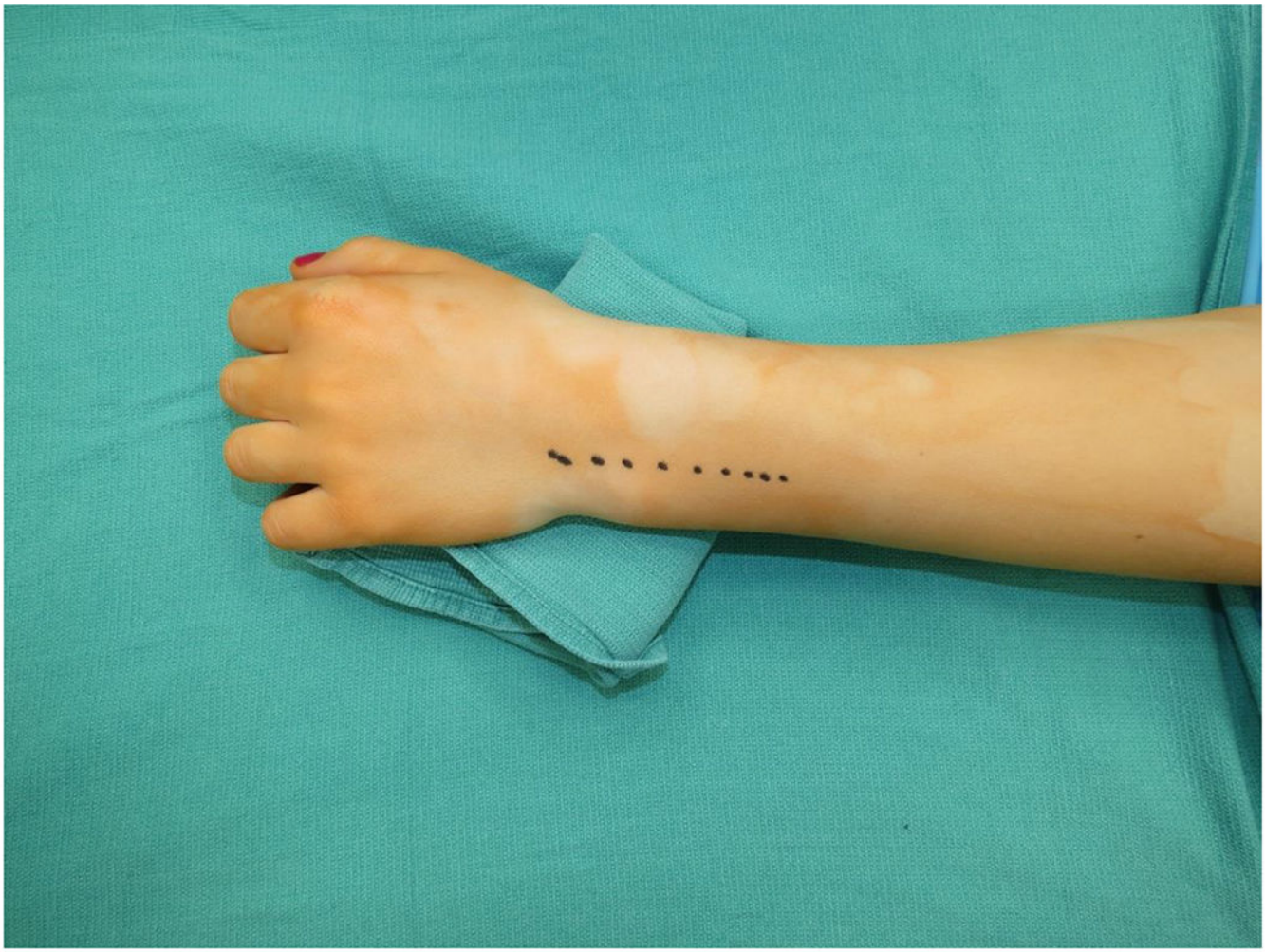

Figure 4.
Planned incision for ECU reconstruction

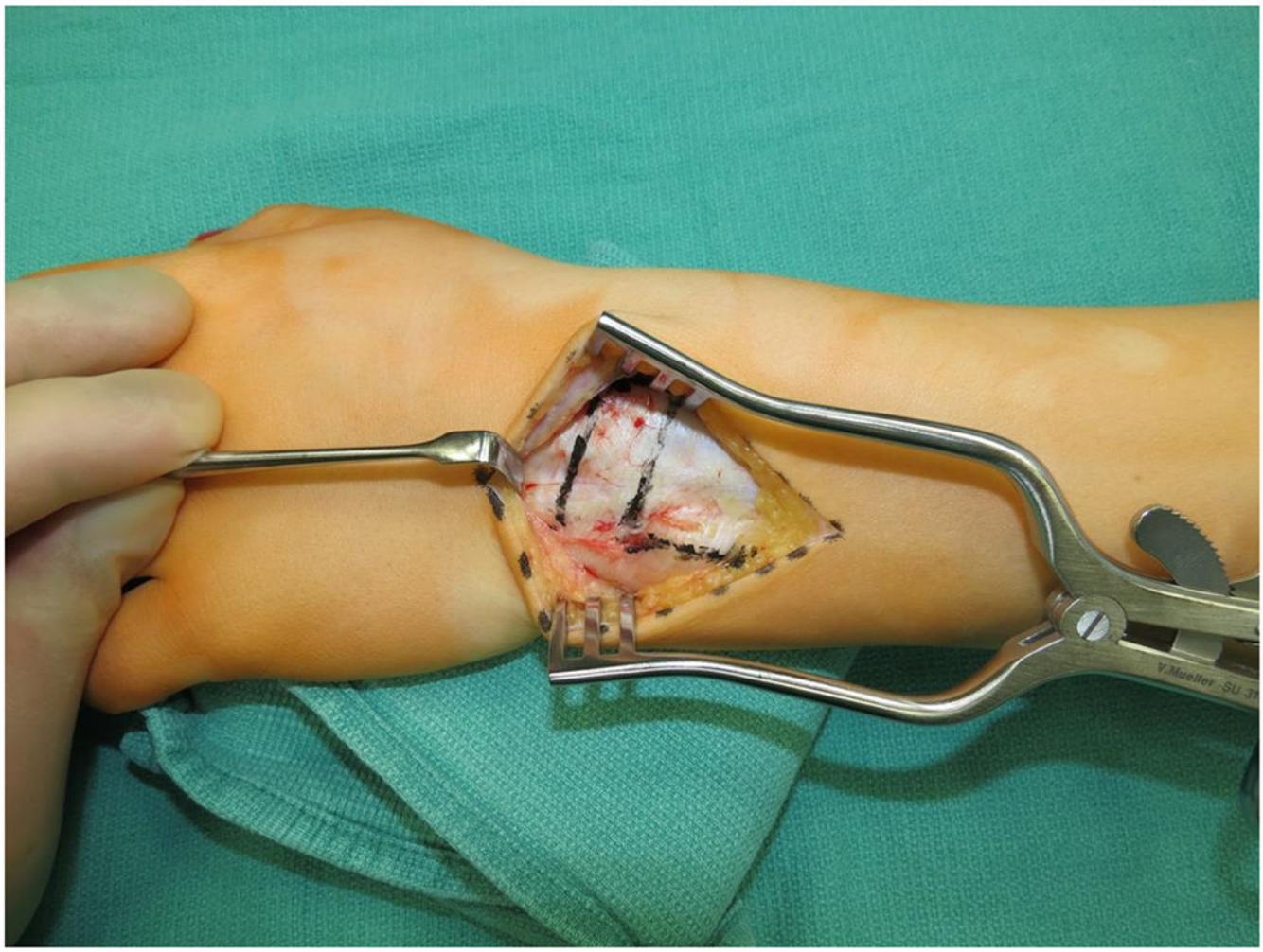

Figure 5.
Planning flap of extensor retinaculum

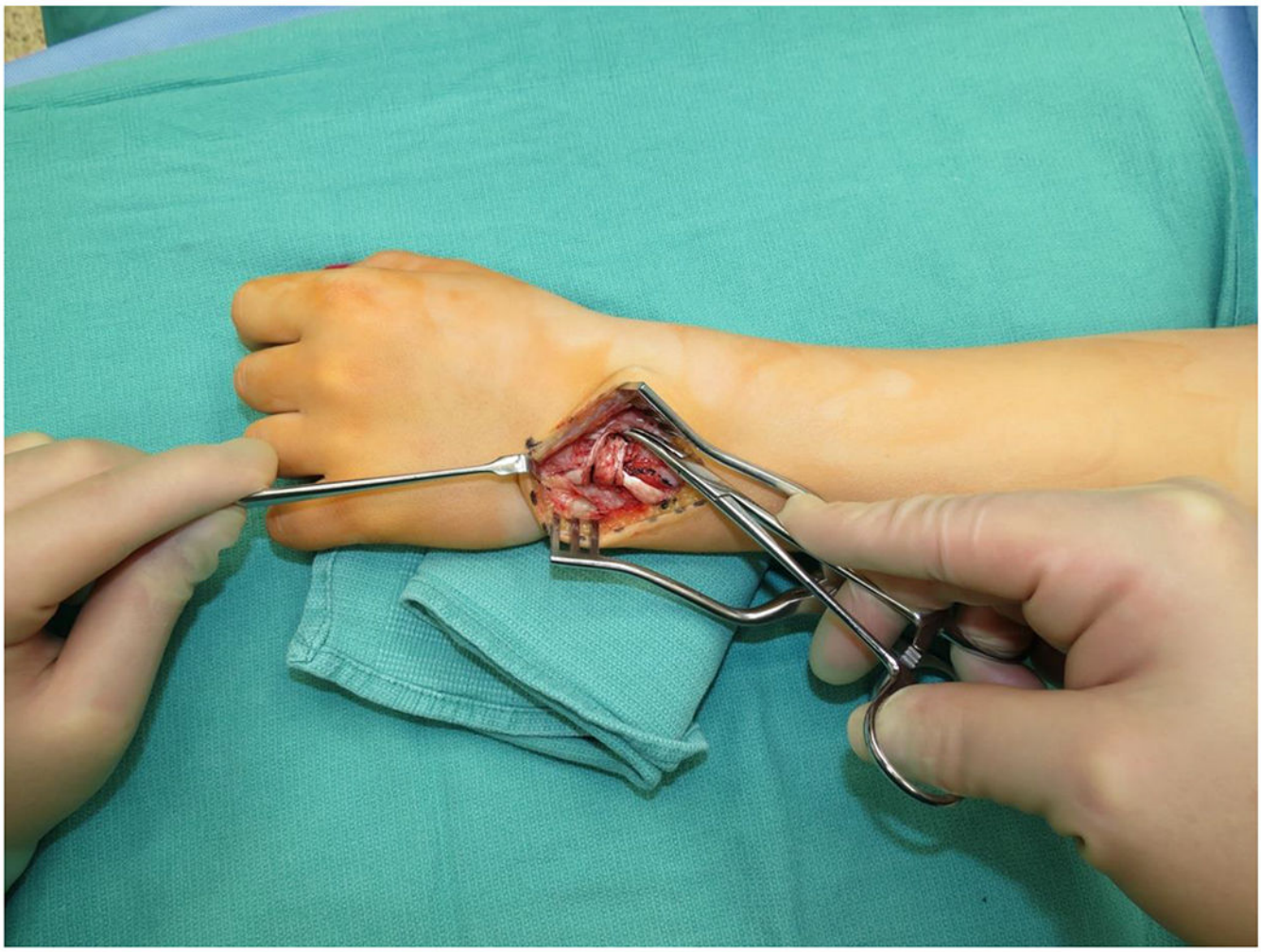

Figure 6.
Passing extensor retinaculum flap under and over the ECU tendon

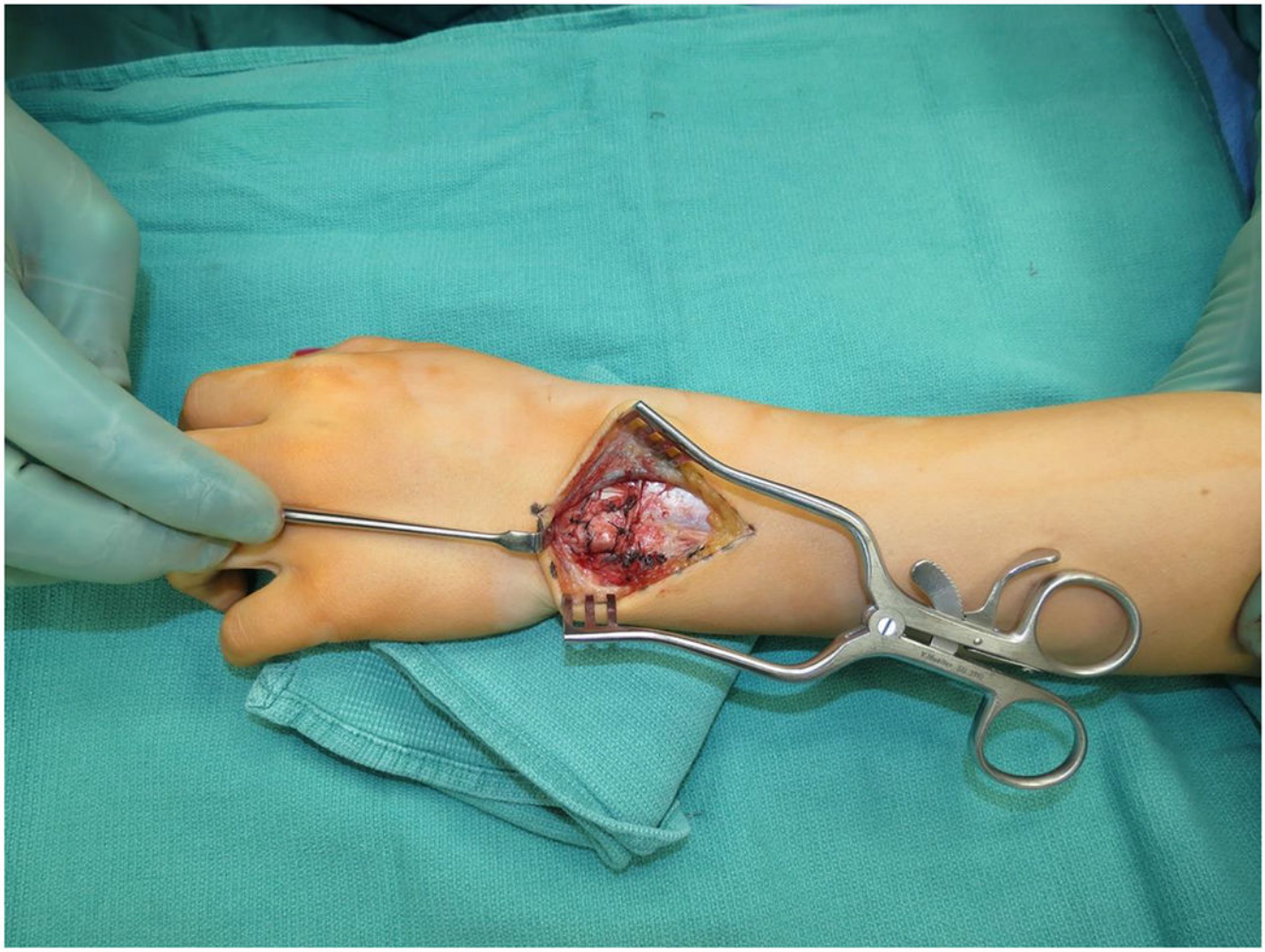

Figure 7.
The completed reconstruction of the ECU sheath with a flap of extensor retinaculum